Microgreens *Growing Guide*

A Complete Beginners Manual for Producing Microgreens

From Scintilla Farms and Paperpot.co
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INTRODUCTION

Microgreens are a rarity in the agricultural world, in that they are a crop that has really only existed since the turn of the twenty-first century. Peas and radishes and various greens of course existed, but growing these seeds densely to a height of just a few inches and then selling them small is a novel enterprise.

To the consumer, microgreens are a product that is extremely nutrient dense, that goes great as either a part of a salad or as a garnish, and that is available year-round.

For growers, microgreens similarly allow year-round revenue. They can be grown anywhere—there's usually no need to purchase or even rent land to start a microgreens business. And they can be quite profitable. Our pea shoots, for example, cost just $2.70 per tray, plus about an hour in total labor. We're able to sell them to chefs for $70 to $80 per tray.

But microgreens are only profitable if they are grown well. There are many nuances to microgreens production—it's not as simple as just tossing some seeds into a tray of soil and waiting for seedlings to come up.

This guide will detail best practices for a new microgreens business. It is based on our __ years of experience at Scintilla Farms in San Diego, California. We produce ____ trays of microgreens each Monday and Friday for same-day-as-harvest delivery to chefs and families. This guide was produced in partnership with Diego Footer at paperpot.co, who supplies us with growing trays that make microgreens seeding simple and reliable.

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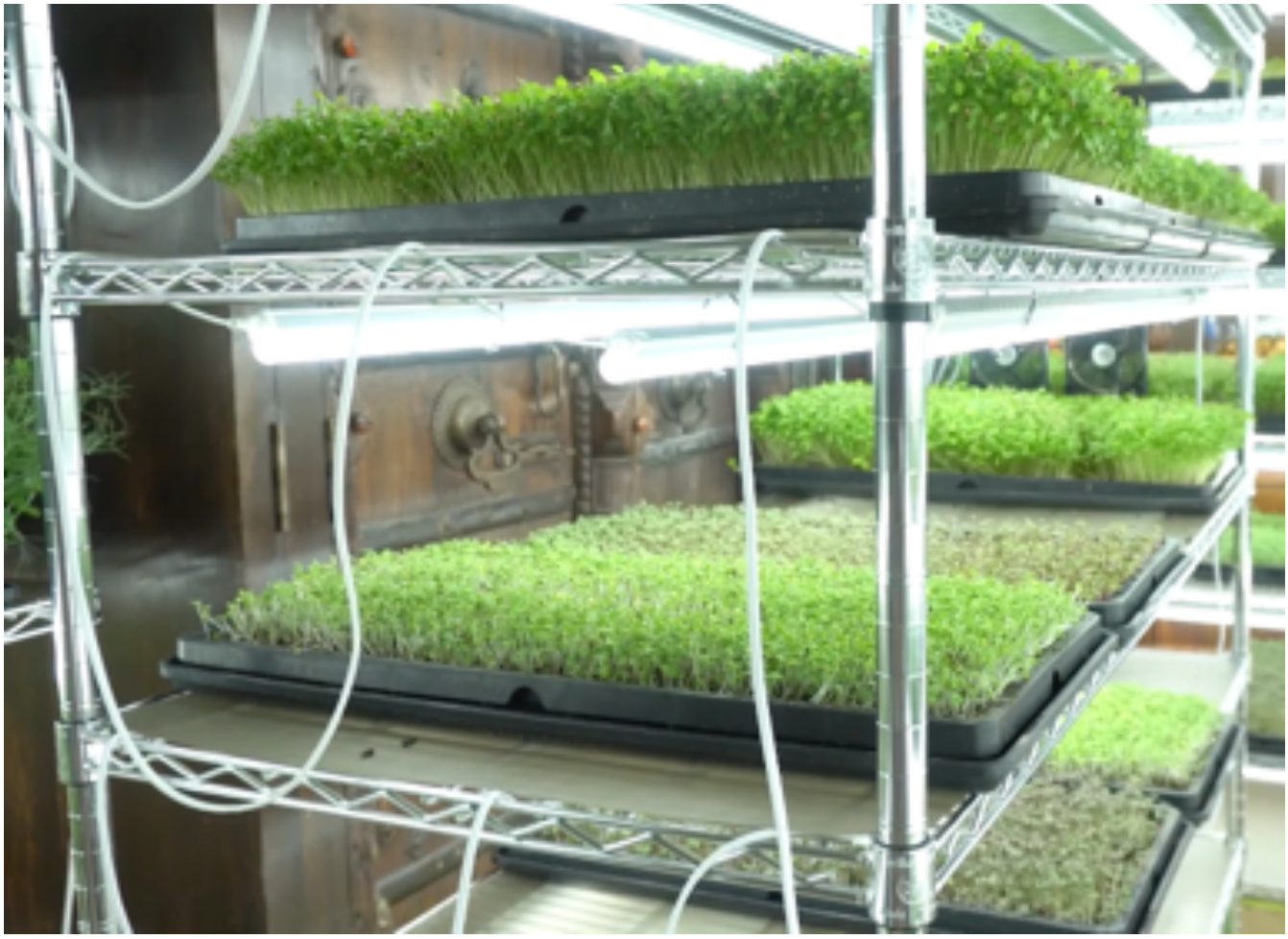
THE GROWING SYSTEM

Your microgreens business will succeed or fail based on your ability to do many things, from marketing and sales to growing techniques and even employee management. Your growing infrastructure—the equipment and tools and raw materials you use to grow microgreens—are only one part of the whole. But they are an important piece, and so we need to begin with a brief overview of what's worked for us at Scintilla Farms.

We'll discuss six elements of infrastructure: light, fans, shelving, watering, soil, and trays.

Light. In our experience, the artificial LED lights we use have performed comparably with natural light. There are exceptions (e.g., basil does grow better with natural light), but being able to fully control light brings consistency to our growing process.

We mount three Barrina LED strips to the top of each 24-inch-deep shelf. Barrina lights don't have an overhang that collects dust, and the LEDs are efficient.



FANS. We've experimented with different fans, but the simplest solution for developing uniform air flow is to mount desktop computer fans at the end of each shelf. Mounted fans save floor space as well. We also use ceiling fans to help regulate temperature and humidity.

SHELVING. Our shelves are all 60-inch-tall, 24-inch-deep Seville lassics racks. These units each come with five shelves, but we often put seven shelves on a single unit. This allows 12 to 14 inches between shelves, which is perfect for most microgreens. The exceptions are peas and sunflowers, which grow taller and need 24 inches between shelves; this translates to five shelves per unit.

WATERING. Except for a misting hose during the germination stage, we exclusively use bottom watering. This keeps leaves and stems dry and helps prevent mold. We simply lift the paperpot top tray by the thumbhole and pour water straight into the bottom tray. Paperpot bottom trays have a line that provides a convenient reference point for how much water to add. We water once in the morning and once at night.

SOIL. Our potting mix consists of cocoa fiber, humus, sand, redwood bark, and worm castings. We buy it from a local farm. Since we're able to buy in bulk, our total cost of soil per tray is $1.64.

There's a debate in the microgreens world about whether to utilize media that includes nutrients. Many growers don't because they feel that microgreens grow so quickly that all the nutrients they need are in the seed itself. But with longer-growing varieties like cilantro or basil, some nutrition can be helpful—without it, by the end of the grow, some leaves start to turn yellow. One solution is to use a nutrient-free medium but to add worm castings into the water.

TRAYS. We are huge fans of paperpot trays for microgreens production. They are much more durable than standard 1020 trays. We had too many experiences with pulling a 1020 off a shelf and having it crack and spill the entire tray. 1020s also taper inwards, making it harder to press the soil in. Additionally, paperpot trays are larger than 1020s, allowing greater yield per tray, and they are UV-resistant, so you can leave them in the sun all day long to dry. Their fingerholes make it easy to pull the top and bottom trays apart for watering, and their bottom holes are uniform.

STEP 1:
FILLING TRAYS

The first step in the microgreens growing process is filling trays with a growing medium.

Sifting. Before we fill the trays, we sift our soil through quarter-inch hardware cloth. Sifting not only aerates the soil; it also helps get rid of big chunks and other unwanted materials that could potentially cause watering issues. It produces a more uniform soil mix and aids in germination.

Varying soil heights Soil height is a big factor with microgreens. Certain soil heights are better for different varieties. Improper soil height can cause poor germination rates because of uneven seed-to-soil contact. uniform soil mix and aids in germination.

1. LOW

To achieve a low soil depth, fill the paperpot tray just above the middle line. Pea shoots and sunflower shoots grow well in low soil heights because of their large seed sizes and because they don't require an additional medium like vermiculite or cocoa coir on top of the seeds. You want the tray above to press down on the soil below it to improve seed-to-soil contact, and thus germination. Having a low soil height for peas and sunflowers enables the tray above to lock into the tray below. Adding more soil does not improve productivity. Since they use less soil than other varieties, peas and sunflowers can be particularly profitable.

2. MIDDLE.

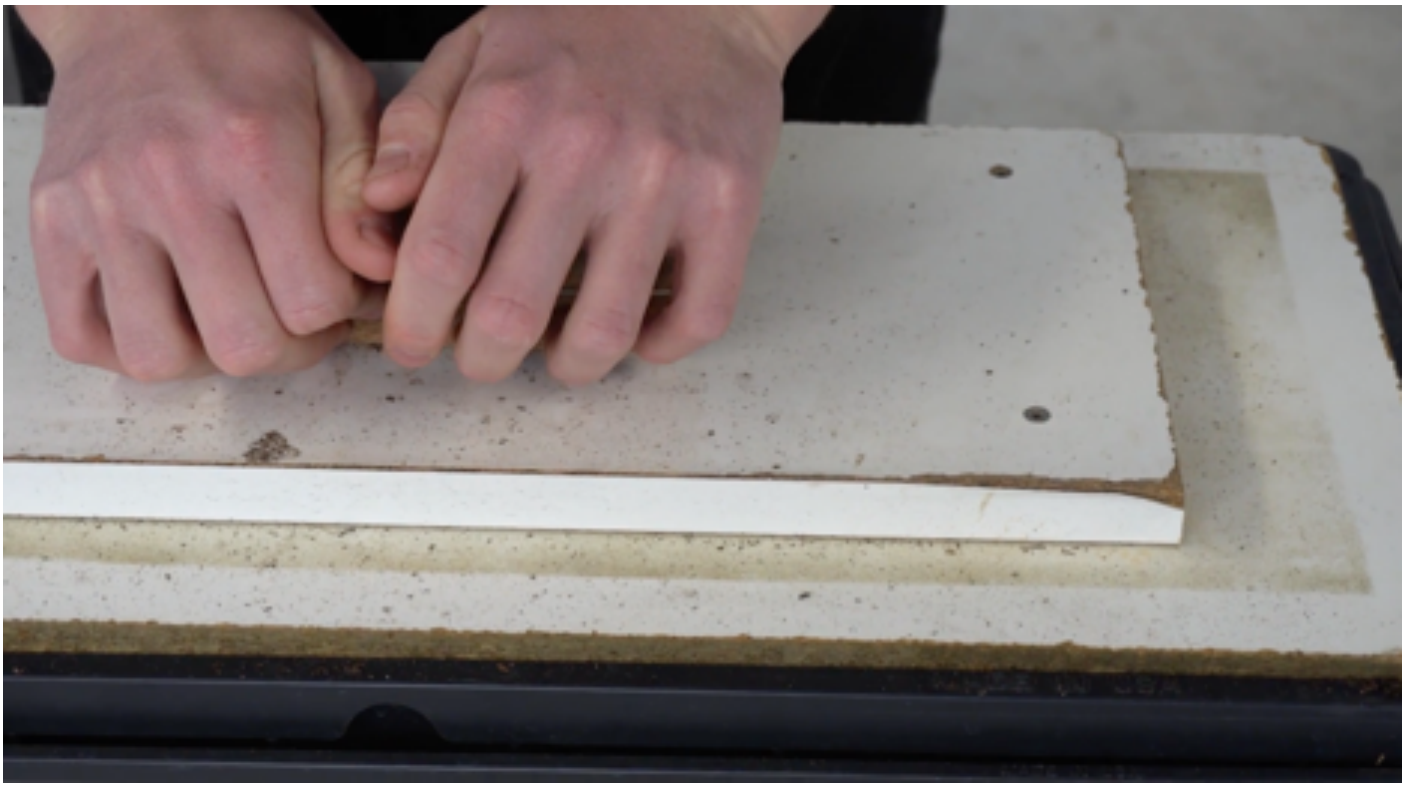
For a middle soil height, fill the paperpot trays until just below the lip of the tray. This soil height is good for smaller seeds like arugula, radish, and amaranth.

3. HIGH.

To get the highest soil height, fill the tray all the way to the top. This soil height is good for crops that don't grow very tall, such as basil and purple shiso. These two crops grow low, which makes them difficult to harvest if you start with a low level of soil.

We don't fill our trays all the way to the top with soil because some varieties need space at the top of the tray to be covered by a medium (vermiculite or coco coir), or to accommodate another germination tray to sit on top of them.

FILLING TRAYS. *Pour the appropriate amount of soil into the tray to achieve your desired soil height. Spread the soil with your hands to level it down as much as possible, making sure to push the soil into the corners. A press board can also be used to further level the soil. A DIY one made from particle board works well for us. Some growers also drop their trays from knee height to help even out the soil.*



Tamping down the soil is important for uniformity; it's easier to seed when the soil is pre-compacted. If you seed uneven soil, expect to have watering issues and skewed trays

STEP 2:
FILLING TRAYS

Once your soil is in the tray, it's time to add seeds. We'll discuss some general seeding concepts here and then go into detail on a few specific varieties in a later section.

SOAK SEEDS. *Soaking some varieties—especially larger seeds like sunflower, radish, peas, and nasturtium—enables better germination.*

Soaking may also help prevent mold issues.

Seeds to be planted the following day can be soaked overnight, although some growers soak sunflowers for only about eight hours. Soaked seeds are a little trickier to seed, but hand-spreading them across the trays works fine.

SANITIZE SEEDS. *If you're still having mold issues even after soaking, or if you think your seeds aren't as clean as you'd like, you can try sanitizing them. After soaking, rinse the seeds and let them sit in a 1:1 white vinegar–hydrogen peroxide solution for 10 minutes. After soaking in the solution, rinse the seeds, and they're ready to be planted.*

MIST THE SOIL. *Mist the soil. Always mist the tray before seeding any crop. Misting not only gives more moisture to the soil—it also helps flatten out and compress the soil, making it a lot easier to spread the seeds.*

General seeding tips:

1. Too much seed can cause mold problems, but more seed means greater yield. The trick is to find that balance.

2. Seed density can affect crop size. If it looks like your crops aren't growing to their full size, try seeding at a lower density. Lower seeding densities can sometimes improve crop size and can actually produce bigger yields.

3 Seed slower. The slower you seed, the more uniform your seed distribution. Slow is smooth and smooth is fast.

4 When seeding the corners and edges, cover them with your hand so no seeds are wasted.

5 You can try using something like a hotdog holder to shake out dry seeds. The sides can be bent to better regulate how much seed is dispensed, giving you more control than using an open cup.

MIST THE SEEDS. After seeding, mist the seeds. Start misting far away, especially when you have smaller seeds and/or a higher-pressure mister. Misting helps pack the seeds into the soil, allowing better seed-to-soil contact.

ADD VERMICULITE. Some varieties grow best with a thin layer of vermiculate covering the seeds. It can help with uniform growth. You can apply vermiculite with a simple plastic cup. Mist the tray one more time afterwards to help keep the vermiculite in place.

	Grams per Tray	Soil Level (L/M/H)	Cover seeds (N/V/C)	Space Box (Y/N)	Stack (Y/N)	Days Under Spacebox	Days Stacked	Days to Maturity	Yield per Tray
Amaranth	30	M	N	Y	N	4	4	12	2 clamshells
Aruguia	35	M	N	Y	N	4	4	12	4 clamshells
Basil	15	H	N	Y	N	7	4	25	2 clamshells
Celery	6	H	N	Y	Y	7	4	28	3 clamshells
Cilandro	42	M	V	N	Y	0	4	21-25	3 clamshells
Nasturtium	175	M	C	N	Y	0	4	21	4 clamshells
Pea	340	L	N	N	Y	0	4	11	6 clamshells
Radish Mix	40	M	V	N	Y	0	4	9	4 clamshells
Green shiso	22	H	N	Y	Y	7	4	25-30	2clamshells
Sunflower	220	L	N	Y	Y	2	4	12	5 clamshells
Leeks	30	M	V	N	Y	0	4	10	3 clamshells

L = Low
M = Medium
H = High

N = None
V = Vermiculite
C = Coir

*NOTE: All of the seeding data is courtesy of Scintilla Farms and is based on their actual numbers.

All data is based on using Paperpot Germination Trays (not 1020 Trays).

Covering trays after seeding

This step in microgreens production may seem counterintuitive. But for some types of microgreens, covering your trays with a weighted germination tray blocks light, which aids germination; it also compacts your soil, providing good seed-to-soil contact. Having a weight to push up against also causes seeds to grow straight and to develop sturdy roots. Sturdy roots mean sturdy microgreens that grow tall.

We use a weighted germination tray on top of each individual seeded tray. A weighted germination tray is simply a tray with bricks on it, rather than soil, that distributes weight equally across the tray.

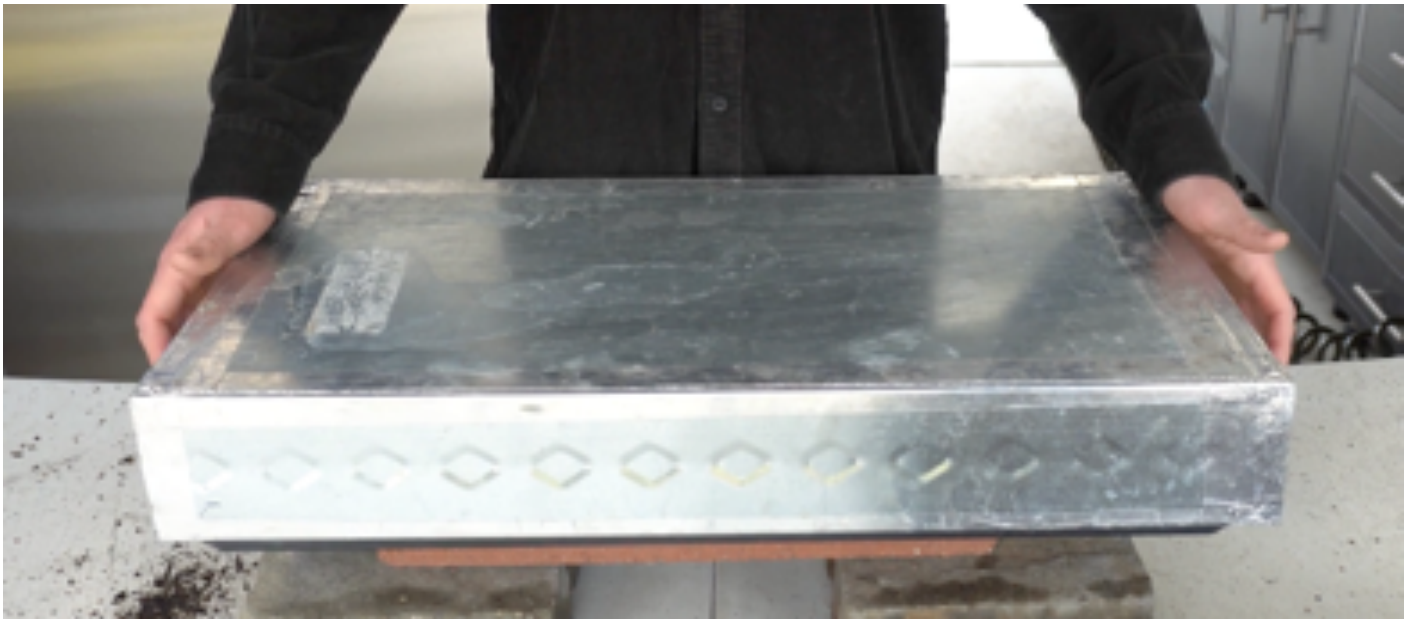
STEP 3:
GROWING

Now that you've seeded and stacked your trays, it's time to let the seeds germinate and grow. Here are some things to know.

WATERING. *During germination, mist the tray daily. When roots begin to appear at the very bottom of the tray, switch to bottom watering twice a day.*

SPACE BOX (BLACKOUT BOX). *Some varieties require a space box that stays on for four to six days to help the microgreens grow taller. For sunflower shoots in particular, the space box can be left on longer; this prevents true leaves from growing, producing a bigger yield and preventing bitterness.*

A space box can be made from aluminum guttering, sheet metal, and aluminum tape cut to fit the size of your trays.



UNSTACKING. *Once smaller crops like basil or cilantro start growing through the holes on the bottom of the weighted germination tray, or once larger crops like pea shoots and sunflower shoots start pushing off the weighted trays, the seeded trays can be unstacked.*

Note that some seeds grow faster than others. Wait another day or two for the rest of the seeds to grow and pop through the holes before removing the weighted germination tray.

To make sure none of the seedlings sticking to the bottom of the tray are ruined when the germination tray is lifted off, lightly tap the germination tray to shake them back.

MOLD ISSUES. *Spraying crops with an 8-mL hydrogen peroxide solution helps in controlling mold problems. The solution is safe and food grade. This saves the microgreens and ensures better yield.*

SEEDING AND GROWING SPECIFIC CROPS

Let's go over the entire seeding and growing process for four common microgreens: sunflower shoots, peas, radish, and cilantro.

Sunflower shoots. Soak your sunflower seeds for about eight hours in water; pour out the water and add a solution of white vinegar and hydrogen peroxide and let soak for ten minutes in order to sanitize the seeds. Rinse the vinegar and peroxide off with water.

Pour the rinsed, strained sunflower seeds into the middle of the tray and make sure to spread them into the corners and edges first. This will make filling in the center easier. A 24- by 12-inch tray (like the paperpot tray) can comfortably accommodate 200 grams of dry sunflower seeds.

You can go quite dense with sunflower seeds. It doesn't matter if the seeds are sitting on top of each other; they will still have great germination rates and will grow right on top of each other.

After spreading the seeds, mist the tray one last time to help settle the seeds into the soil, and place an evenly weighted tray on top. Mist them again the following day.

At about the fourth day, the sunflower shoots will start pushing off the weighted tray. At this point, the weighted trays can be replaced with a space box. After about three more days, the shoots will grow to about 4 inches tall and will start pushing off the space box. When this happens, they're ready to sit in the light for three days, until harvest.

You may encounter mold issues on your sunflower shoots—mostly, if not always, on the seed hulls. Once you spot mold on a hull, pluck it off using a pair of tweezers. Just to be on the safe side, you can also spray the surrounding area with a weak 8-mL hydrogen peroxide solution.

The trick to removing 100 percent of the hulls is to keep them soft by keeping them wet. Daily misting during germination is a good way to keep the seed hulls soft. By the time the shoots are ready to sit in the light, the seed hulls will be at their softest. If you run your fingers through the shoots while they're wet, the hulls will pop off easily.

Pea shoots. Peas are very easy to grow, especially when you get an excellent batch of seeds. In many ways, growing pea shoots is similar to growing sunflower shoots.

Before seeding, soak the seeds overnight or for about eight hours. Unlike sunflowers, there's no need to

sanitize the seeds. After rinsing and straining, pour the seeds into the tray and spread them out as evenly as possible. Mist the seeds to help them settle into the soil better and then place a weighted tray above it. A paperpot tray can comfortably accommodate 340 grams of dry seeds.

As soon as the pea shoots start pushing off the weighted tray, you can either place them under a space box, if you don't want leafy peas, or you can skip the space box entirely and place the pea shoots under the light.
Pea shoots and sunflower shoots have similar growth times of about ten days, which is why many growers start them together.

Radish. Radish is not only one of the easiest crops to grow—it's also cheap, and it grows fast, making it an excellent crop for beginner growers. Radish microgreens can be harvested in nine days, and as fast as seven days in the summertime.

Radish can be seeded either soaked or dry. A good seeding density for radish is 40 grams per paperpot tray. Some growers seed single-variety radish in one tray while some prefer to create their own mixes to have different flavors and different colors. Some varieties that we mix and match are China Rose, Rambo, and daikon.

Start with a mid-height soil to make room for vermiculite or coconut coir on top. For soaked radish seeds, it would be difficult to try shaking them out like dry seeds; instead, pour the seeds into the tray and spread them by hand, making sure to cover the edges and corners.

Don't worry if the seeds aren't spread uniformly; radish seeds do a good job of spreading out and finding their own space.
After spreading the last of the seeds, cover the tray with a medium (vermiculite or coco coir) to add nutrients for the crop, and lightly mist the tray to help it all settle. Make sure to mist from a good distance, especially if your medium is light; otherwise it will all be blown away. Lastly, top off with a weighted tray for about three to four days, or until the shoots start pushing off the weighted tray. Then you can move them under light for about _____ days until harvest.

Cilantro. Cilantro is a crop that many growers would consider tough to master because of its many challenges, such as the steep learning curve with watering—too much water and you'll end up with poor germination rates, but too little and you'll get a ton of seed hulls, and mold. Mold on cilantro is a losing battle. If you're not careful, you'll end up tossing the tray 99 percent of the time. It can take a lot of trial and error to grow cilantro well in your context.

Similar to radishes, start with mid-height soil to make room for a medium covering later. Seeding at a density of 42 grams dry weight works well for paperpot trays. A top covering of either vermiculite or coco coir helps improve and even out cilantro's germination rates. Since coco coir is soft, it won't remove a lot of the hulls when the cilantro begins to break through the medium. This is why we use vermiculite—it's more abrasive, helping remove most of the seed hulls once the cilantro begins to grow.

Finally, mist the tray to pack everything in. Place an evenly weighted tray on top for seven days.

Depending on your preference, the cilantro can be harvested after two weeks—yielding palm tree–looking microgreens that still taste like cilantro—or after three to four weeks, when the dainty, frilly true leaves come out, which many chefs like.

STEP 4: HARVESTING

The most important thing to know about harvesting is to use a sharp knife. Scissors or an electric knife can tear the stems instead of a providing a clean cut; this leads to water dripping out of the greens, and excess water inside the clamshell makes the greens wilt quicker. Sharpen your knife before every harvest.

To harvest, grab handful of greens and start cutting high enough above the vermiculite that there isn't any stuck on the ends of the greens. The space box encourages higher growth, making harvesting easier. We strive to keep our greens clean throughout the process so we don't need to wash them; not washing saves time and enhances shelf life.

After cutting, place microgreens upright in the clamshell. This allows water to drain down so the greens aren't sitting in water. Clamshells enable this much better than plastic bags and are thus better for shelf life.

After you've filled your container, leave it open in the refrigerator or cooler for the first 10 to 15 minutes to prevent moisture from building up in the clamshell.

Our greens last several weeks in the refrigerator, compared to just a few days for commercially produced greens. This has been a big reason for our success with chefs.

Post-harvest

After harvest, we simply dump the used soil on the ground outside and let it dry for a day or two. Then we put it back in its original bag and return it to our local nursery to be re-composted.

We blow out our used trays with a hose to remove root matter and soil. Then we scrub the trays on a washing table with regular dish soap, rinse them water, and sanitize them with a hydrogen peroxide / white vinegar solution.

Conclusion

At Scintilla Farms we now grow seventeen different varieties of microgreens. But we highly suggest you start with no more than three to five. When adding new varieties, do at least three or four successful grows before offering them for sale.

SOIL

Microgreens Soil

Having good soil for your microgreens is crucial to having a healthy, disease-free crop.

Quick Starting Point:

Use a 'Seed Starting' mix from a local supply store. Most of these mixes have a fine texture and include coir, peat, perlite, or vermiculite. Sunshine Mix #4 is a commonly available mix in North America.

Basic DIY Mix

- 70-75% Coir or Peat Moss*****
- 20-25% Perlite or Vermiculite
- 5-10% Compost******

***** Peat has a low pH, so it might be necessary to offset that with lime.

****** Decrease the percentage of compost as the compost nutritional value goes up. If you have compost with high electrical conductivity (>5), you may need to reduce the amount of compost used to avoid water balance issues in the media.

ALWAYS test soil mixes with various crops in small batches before purchasing or mixing large amounts.

Soil-Based Media:

Soil provides a medium for microgreens to grow during their 7-15 day lifecycle. The medium gives the roots an anchor point, holds water, provides nutrients, and maintains air space.

Pros

- Customizable in terms of the mix
- Customizable in terms of the depth in the tray
- Cheaper than non-soil media
- Readily available in most locations
- Some growers contest it grows a better looking and better-tasting crop
- Easy to compost
- Better water holding capacity than non-soil alternatives
- Possibly creates a more biologically active growing

Cons:

- Depending on the ingredients, it may harbor pathogens
- Heavier
- Harder to store and transport
- Less precise tray to tray

Characteristics of Ideal Microgreens Soil

- Light – less likely to break trays, physically easier to handle in production
- Holds water, yet drains well – opt for trays with holes to aid in drainage
- Adequate nutrition for crop life cycle – microgreens aren't in the soil for very long, so they don't need a lot of nutrition in the soil, so provide some through a source like compost, but don't go overboard
- Disease-free – clean, less potential problems, ask your supplier for any testing done on the soil
- Affordable and available all year-round – might be a challenge in some areas, especially in the winter months
- Pre-mixed – convenient, saves time and effort

1. Peat Moss, Coir, or Both – water holding, bulk material
2. Peat – deposit of dead plant material, mined in peat bogs, not very sustainable
3. Coir – a by-product of the coconut industry, shredded coconut husk, sustainable
4. Perlite, Vermiculite, or Both – keeps the soil light, helps with the drainage
5. Vermiculite better cation exchange holds and releases water well
6. Compost – nutrient source & microbial life, too much might lead to mold problems
7. Not required but gives crops a growth advantage
8. Optional - Mineral Additives and Lime. Could be added for nutrition, pH balance
9. Important if you plan to compost the soil after harvesting crops

Other Soil Considerations

- Bulk purchasing brings the price down
- Storage:
  - How much can you store?
  - Can you keep it dry and protected from weeds and pests?

Non-Soil Alternatives:

Grow mats made from materials such as hemp fiber are a soil-less alternative for microgreen growers.

Hydrate the grow mat, lay it into the tray, and start seeding. The process is quick and precise.

Pros

- Preferred by chefs who want live-cut trays
- Yield a "cleaner" product with no soil debris
- Less perceived pathogen risk over soil medias
- Convenient
- Quick
- Lightweight
- Easy to store

Cons:

- More expensive than soil
- Possibly harder to source than soil
- Harder to compost compared to soil
- Typically thinner than soil which can result in smaller crops
- Less water holding capacity than soil
- Some materials can be hydrophobic initially, making them hard to wet.
- Mats don't' fit perfectly into trays
- Nutrients needed to be added in a liquid form with water
- Not customizable compared to soil mixes
- May not be approved for organic production

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TOOLS FOR THE MODERN GROWER